REMARKS/ARGUMENTS

Amendments

Claim 14 has been amended to recite "vol%". Support for this amendment is found on page 5, line 18. Claims 17 and 25 have been amended to change dependency. Support for the carbon chain less than five carbon atoms limitation is found on page 2, lines 11-14, and page 3, lines 11-12. Support for newly added claim 34 is found on page 3, lines 20-22. Support for newly added claim 35 is found in original claims 5, 6, 9, and 12. It is submitted that no new matter is introduced by these amendments and new claims.

Claim Objection

"Claim 1" was objected to because "the expression '25 to 80%' is missing a unit." Paper 10, page 2, line 9-10. It is respectfully pointed out that "claim 1" was cancelled and there is no "claim 1" pending in the application. Claim 14 has been amended to recite that "the lube oil distillate comprises 25 to 80 vol% of the aromatic material". It is submitted that this objection has been overcome.

Declaration under 37 CFR 1.132

A Declaration ("Raman Declaration") under 37 CFR 1.132 by Dr. N. S. Raman, a co-inventor of the above captioned application and an employee of the Indian Oil Corporation, the assignee of the above captioned application, accompanies this response.

Rejection under 35 USC 103

Claims 14-33, all the claims pending in the application, were rejected as unpatentable over Henry, U.S. Patent 3,929,617. The Office position is with respect to Henry stated as follows:

> Henry discloses that the solvent can be a mixture of solvents selected from a list that includes a mixture of furfural and dimethylformamide (aliphatic amide). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Henry by using furfural and dimethylformamide because one of ordinary skill in the art

would pick any combination of solvents in the list including the combination of furfural and dimethylformamide.

Paper 10, page 3, line 19, to page 4, line 2.

For the following reasons, this rejection is respectfully traversed.

1. The Office has not made the *prima facie* case

As described in the previous communication, applicants' position with respect to Henry is that the claimed invention is not a modification of the process of Henry as described by the Office. The feedstocks used by Henry and by applicants have different compositions so applicants' process is fundamentally different from that of Henry.

Applicants' claims recite extraction of a lube oil distillate that comprises 25 to 80 vol% aromatic material. Henry discloses extraction of a hydrocracked feedstock. *See*, for example Henry, column 2, lines 47-54. As is well known to those skilled in the art, hydrocrackates, which are formed by passing a feedstock over hydrogen in the presence of catalyst, are low in aromatic material. *See* also, Raman Declaration, paragraph 6.

Henry removes aromatic constituents from a feedstock that contains a relatively small amount of aromatic constituents. In contrast, applicants' process removes aromatic constituents from a feedstock that contains a relatively large amount of aromatic constituents. Because of the large amount of aromatic constituents, this is a much more difficult problem. The person of ordinary skill in the art, having the advantage of the teaching of Henry, would not expect the process disclosed by Henry to have a high probability of success for lube oil distillates with 25 to 80 vol% aromatic material. At best, Henry's process, the solvents disclosed by Henry, and combinations of the solvents disclosed by Henry, are "obvious to try." However, the Federal Circuit has held that "obvious to try" is not the same as obviousness under 35 U.S.C. 103(a). *Gillette Co. v. S.C. Johnson & Son, Inc.*, 16 U.S.P.Q.2d 1923, 1928 (Fed.Cir. 1990) (*citing cases*). Thus, the Office has not made the *prima facie* case.

2. Unexpected Results

Even if, for the sake of argument, the Office has made the *prima facie* case, applicants' have presented evidence of unexpected results.

Attention is directed to the Declaration ("Raman Declaration") under 37 CFR 1.132 by Dr. N. S. Raman, a co-inventor of the above captioned application and an employee of the Indian Oil Corporation, the assignee of the above captioned application.

The solvent extraction process removes aromatic constituents from hydrocarbon oils. Because aromatic hydrocarbons have generally higher refractive indices that aliphatic hydrocarbons, an increase in refractive index (RF) for the raffinate indicates that the proportion of aromatics has increased. No change in refractive index indicates that the proportion of aromatics is essentially unchanged.

Table 1 of the Declaration shows extraction of Inter-Neutral Distillate with furfural at different solvent to feed ratios. When the solvent to feed ratio of furfural was decreased, the yield of the raffinate, the material that is not removed by the selective solvent, increased. However, the refractive index increased, indicating that the raffinate contains relatively more of the undesired aromatic constituents. Therefore, when furfural was used without a co-solvent, an increase in raffinate yield was accompanied with a decrease in raffinate quality.

Table 2 of the Declaration shows extraction of Inter-Neutral Distillate with furfural and dimethyl formamide (DMF), a solvent of the invention, at a solvent ratio of 1.0 and at different percentages of DMF. As the percentage of DMF increased, the raffinate yield increased, but the refractive index remained the same over the range of 1 to 30 wt% DMF. Therefore, when furfural was used with DMF as a co-solvent, the raffinate yield increased but the raffinate quality was essentially unchanged.

Table 3 of the Declaration shows extraction of Inter-Neutral Distillate with furfural and N-methyl pyrrolidone (NMP) at a solvent ratio of 1.0 and at different percentages of NMP. As the percentage of NMP increased, the refractive index decreased. However, the raffinate yield also decreased. Therefore, when furfural is used with NMP as a co-solvent, a decrease in raffinate yield was accompanied with an increase in raffinate quality. Or, an increase in raffinate yield was accompanied with a decrease in raffinate quality.

NMP is one of the solvents cited by Henry, which is cited by the Office as the closest art. See, Henry at column 6, line 13-19. Further, NMP is commonly used for solvent extraction in refineries. *See*, "Solvent Extraction," Shell Global Solutions, Glossary S-Z, page 3, and

"Raffinates," Shell Global Solutions, Glossary O-R, page 6 (both available from the Internet at http://www.shellglobalsolutions.com), copies of which are enclosed.

The results are summarized as follows:

Extraction Solvent	Yield	RF	Raffinate Quality[a]
Furfural	Increases	Increases	Decreases
Furfural/NMP	Increases	Increases	Decreases
Furfural/DMF	Increases	Unchanged[b]	Unchanged

[a]As measured by raffinate refractive index.
[b]Over the range of 1 to 30 wt% DMF.

Applicants' results are unexpected. When furfural is used by itself, without a co-solvent, as raffinate yield increases, the raffinate quality decreases. When furfural is used with NMP as a co-solvent, as raffinate yield increases, the raffinate quality decreases. However, when furfural is used with DMF, a co-solvent of the invention, the raffinate quality does not decrease as the yield increases.

In addition, NMP is specifically recommended for the extraction of aromatics because it has "a higher selectivity for aromatics that either phenol or furfural." *See*, "EXOL N™ Solvent Extraction Technology," ExxonMobil, page 1 (available from the Internet at http://www.prod.exxonmobil.com) , a copy of which is enclosed. This constitutes a teaching away from applicants' invention. The person of ordinary skill in the art, wanting to extract aromatics constituents from a feedstock having a relatively large amount of aromatics would use NMP instead of furfural, because the art teaches that NMP has a higher selectively for aromatics than furfural.

A *prima facie* case may be rebutted by the existence of unexpected properties. Even if the Office has made the *prima facie* case, applicants have overcome the *prima facie* case by a showing of unexpected results. The rejection of claim as unpatentable over Henry, U.S. Patent 3,929,617, should be withdrawn.

Conclusion

It is respectfully submitted that the claims are in condition for immediate allowance and a notice to this effect is earnestly solicited. The Examiner is invited to phone applicants'

attorney if it is believed that a telephonic or personal interview would expedite prosecution of the application.

Extension of Time

A check for a two-month Extension of Time accompanies this response. Pursuant to 37 C.F.R. § 1.136(a)(3), the Director is respectfully requested to consider this check as a constructive petition for an extension of time.

Respectfully submitted,

Allan Ratner, Reg. No. 19,717
Bruce M. Monroe, Reg. No. 33,602
Attorneys for Applicants

Dated: December 16, 2003

Enclosures: Declaration under 37 CFR 1.132
"Solvent Extraction," Shell Global Solutions, Glossary S-Z.
"Raffinates," Shell Global Solutions, Glossary O-R.
"EXOL N™ Solvent Extraction Technology," ExxonMobil

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The Commissioner for Patents is hereby authorized to charge payment to Deposit Account No. **18-0350** of any fees associated with this communication.

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December 16, 2003

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EXOL N™

SOLVENT EXTRACTION TECHNOLOGY

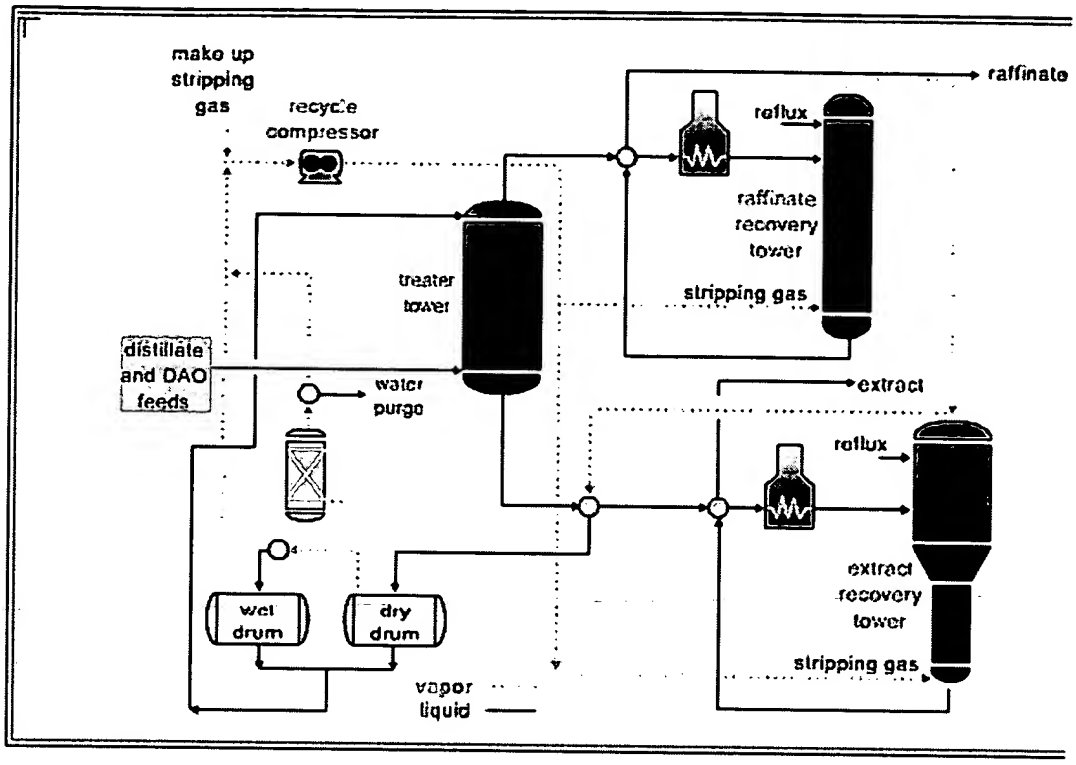
Choose this proven path to increased yields and efficiency!

ExxonMobil's highly efficient and proven extraction process, EXOL N™ is promot its proprietary, innovative tray design in the treater tower. This tray design pro higher capacity and increased efficiency with a higher raffinate yield at lower solvent treat rates. Plus, the solvent used for EXOL N, NMP (n-methyl-2-pyrrolidone), is relatively non-toxic and possesses excellent physical and chemical properties with a higher selectivity for aromatics than either phenol or furfural. EXOL N's ability to remove the undesirable aromatics and polar components of a lube feed stock from the desirable paraffinic and naphthenic components meets the required product viscosity index and saturates content in the corresponding dewaxed oil. Compared to phenol, NMP has faster settling rates a lower specific heat, requiring less energy for solvent recovery. And compared tc furfural, NMP is more thermally and chemically stable, more selective, requires energy for recovery, and avoids the need for a feed deaerator.

Expect these advantages:

- More stable, reliable plant operation
- Reduced energy and operating costs
- Safer operations with less toxic solvent
- Increased efficiency for heat integration
- Simplified solvent recovery
- Selective solvent increases yield at lower treat rate
- Proprietary extraction tray design

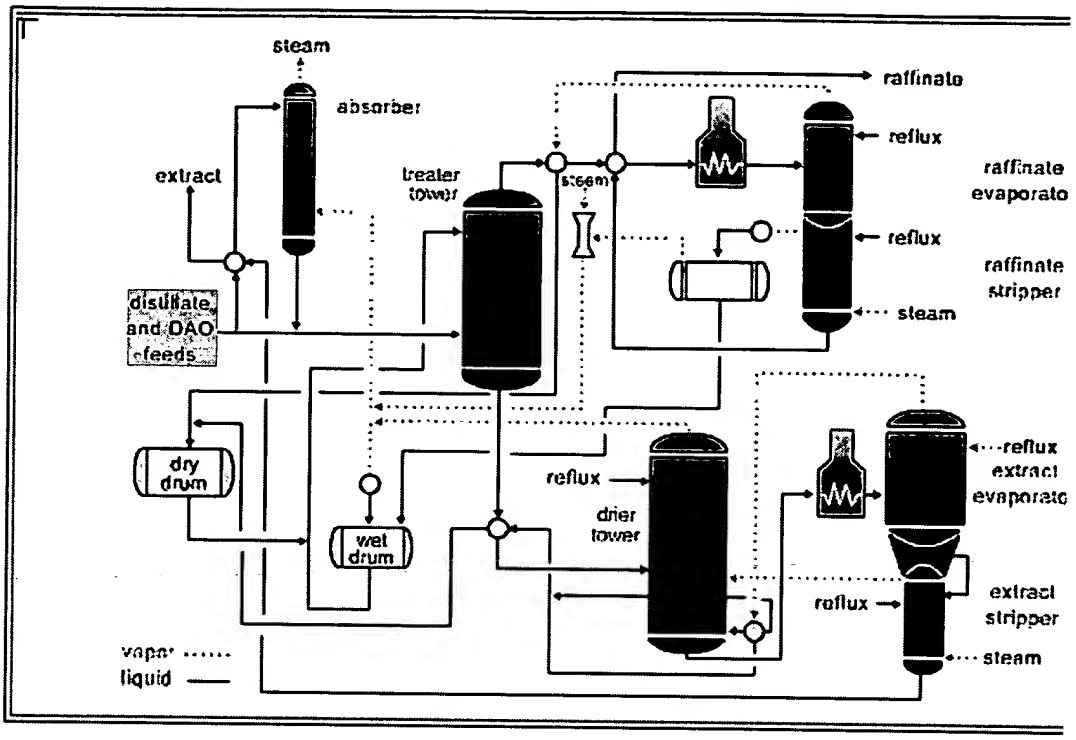
Gas Stripped EXOL N Extraction



A Simpler, Safer Process with Increased Selectivity

The intimate contacting of the raffinate and extract solution phases within the t tower is the crucial step to ensuring an efficient extraction process. The oil feed enters the bottom of the treater while the NMP solvent, containing a carefully controlled amount of water, enters the top of the treater and countercurrently contacts the rising raffinate solution. The oil-rich phase leaving the top of the tr contains the raffinate product saturated with solvent. The heavier extract soluti phase exits the bottom of the treater carrying the extracted aromatics and pola components. The solvent is recovered through either gas or steam stripping. Fe EXOL N can be either vacuum distillates or deasphalted oils.

Conv rsion of Steam Stripped Ph nol Extraction to EXOL N Extraction



Extensive Research and Commercial Experience Means Performance Y Trust

EXOL N is a reliable, proven technology in practice for decades. ExxonMobil's de and commercialization experience includes nearly two dozen EXOL N extraction some of which are grass roots and most of which are conversions from phenol. EXOL N unit can be integrated with a lube HYDROFINING™ unit to be called an EXOLFINING N™ unit. In fact, half of the EXOL N units use an EXOLFINING N configuration and have a fully-integrated HYDROFINING unit.

To learn more about ExxonMobil's EXOL N process, contact:

ExxonMobil Research and Engineering
Technology Sales & Licensing
3225 Gallows Road
Fairfax, Virginia 22037-0001
phone (703) 846-2568; fax (703) 846-2725

◄ Lubes Technologies | Cor

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Glossary of terms

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O

OECD - Organisation for Economic Cooperation and Development

OEM - original equipment manufacturer, e.g. an automobile manufacturer

Oil gasification - the conversion of petroleum into syngas to be used as a fuel or chemical feedstock

Oligomer - di-mers, tri-mers or tetra-mers, i.e. the molecules formed from the bonding of 2, 3 or 4 monomers

OP - Oil Products (business) sector of Shell

OpCo - operating company. Also known as company

Opex - operating expenditure. Also known as revex - revenue expenditure

Optimisation - the process of maximising the economic benefit from a unit or complex of units. May be performed online in an optimiser

Outlet - a location where Shell products (and other goods or services) are supplied and payment is made in cash or cash equivalent (cheque, credit card, voucher) at the time of product collection

Oxidation - the act of reaction with oxygen of, e.g., a base oil forming acids and often associated with a degradation of colour

Oxidation stability - when exposed to air over time base oils react with oxygen and degrade. When used in engines the high temperature can cause base oils with poor oxidation stability to form corrosive acids, insoluble sludge etc. [click

for more details]

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P

P&L - Profit and loss account. Also known as income statement (when applied to a single year)

PA - propane asphalt - from PDU

Pacesetting - the brand name for the Shell Global Solutions' programme to enable its customer refineries to be best in class in the industry

Pacesetting modules - activities carried out as part of a Shell Global solutions' Pacesetting programme

PAE Hamburg - Shell Global Solutions laboratory in Hamburg

Paraffin - saturated hydrocarbons sub-divide into iso-paraffins and normal paraffins

PCA - polycyclic aromatics, the mass of aromatics that are soluble in DMSO according to the standard test IP-346. According to EU legislation no label is required for a product provided the PCA content is less than 3 %. Products containing more than 3% PCAs must be labelled as potential dermal carcinogens, cf. PNA

PDU - propane deasphalting unit

Petrolatum - a jelly-like product obtained from petroleum and having a microcrystalline structure

Petroleum - the general name for hydrocarbons, including crude oil, natural gas and NGLs. The name is derived from the Latin oil, oleum, which occurs naturally in rocks, petra

PFD - process flow diagram, scheme of the vessels, lines, columns, valves, pumps, etc. in a plant

pH - a log scale measure of the acidity of water pH = log [H+]

PIN - personal identification number

Plant - a configuration of processing, blending and storage facilities which make up a composite facility

Platforming - a catalytic reforming process using a platinum catalyst

PNA - polynuclear aromatics, aromatics detected by GCMS (gas chromatography-mass spectrometry) methods, e.g. the Grimmer method c.f. PCA

Polymer - a complex compound in which single molecules (monomers) are chemically joined together in long chains. Desired products sometime, e.g. plastics, and undesired other times, e.g. coke, polymerised hydrocarbons, depositing on the surfaces of heat exchangers, etc. in refineries

Pour point - the temperature at which a lubricant or base oil will pour or flow when it is chilled without disturbance under specified conditions

Pour point depressant - additive that retards wax crystallisation and lowers the pour point

Pour point differential (ppd) - the difference between the temperature at which the dewaxing occurs in the MDU and the pour point of the resulting base oil

ppm - parts per million

Predilution - the dilution in an MDU before it starts to be cooled

Process model - equations to calculate yields and selectivities for the conversion of a feedstock over a continuous range of operating modes of a plant

Process oil - a base oil or lubricating oil that is wholly consumed in another process, e.g. the manufacture of car tyres

Product - any hydrocarbons or related substances, i.e. feedstock, intermediate products or components, end products, additives, mixtures of the above. This term is often used synonymously with finished product (i.e. the product in its final state after all processing and blending has been completed)

Product formulation - see Formulation - as applied in the LOBP

Product properties - the basic thermodynamic and other physical and chemical properties of a product

Product slate - total set of products resulting from one specific process in a production facility

Production plan - plan of production operations for lumped time periods and for lumped operations

Production schedule - plan for production operation runs, based on the production plan but with added detail about events, time instants and operating modes. The schedule includes technical and economic constraints and the driving forces for further (on-line) optimisation of the operation

Project - the design, engineering, procurement and construction or installation of property, plant, facility or equipment or

- the development of new products or
- a structured series of activities carried out on behalf of a customer in order to develop and define the technical requirements of the customer's capital-investment proposals for an oil-refining and gas-processing plant and their associated facilities

Project specification (PS) - a project-definition package which consists of:

- general project information, scope of work and local information
- design information
- basic engineering information
- project procedures including standards, specifications and drawings

Propane (C3H8 or C3) - hydrocarbon, consisting of three carbon atoms and eight hydrogen atoms; a gas under normal conditions. Used as the solvent in the PDU to remove the asphalt components from short residue making the de-asphalted oil (DAO). Propane liquefies at -42°C. See also: LPG

PROSS - PROcess Supervision computer System

PSA - pressure swing absorption. Process used in BOMPS for manufacture of inert gas (N2 with < 0.5% O_2) from air by absorption on molecular sieves

PSE - propane asphalt/short residue/extract route for bitumen

PSFS -process safety flow scheme, the PFD containing details of the safety schemes implemented in a plant

PSS - product supply specification. A Shell Global Solutions product defining the specifications that a refinery product must meet

in order to satisfy the demands of the market. Separate sets of specifications are available for all products from gases to waxes and bitumen

PTO - paraffin transformer oil

Pulau Bukom - site of refinery in Singapore

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Q

QMI - quality measuring instrument, an on-line instrument determining a measure of the stream quality (pour point, oxygen content, etc.) as opposed to its temperature, pressure or flow rate

Quality - meeting agreed customer requirements. This has been derived from the international standard on quality vocabulary (ISO 8402) which defines quality as the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs. See also ISO 9000

Quality giveaway - the difference between the quality of a product delivered to a customer and the quality of the product ordered by the customer, where the quality received is higher than the quality ordered, and producing the higher quality may have incurred some cost to the manufacturer

Quality management system - the procedures specifying how Shell Global Solutions is managed and run

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R

R & B - ring and ball temperature (for residues)

Raffinates - in solvent refining, the portion of the oil which remains undissolved and is not removed by the selective solvent (furfural or NMP), i.e. waxy raffinate. In hydroprocessing routes, the product from the HTU, i.e. hydro-raffinate

RCM - reliability centred maintenance: a (Shell Global Solutions) structured approach to ensure that all available data and knowledge is used to arrive at an optimum maintenance regime

RCR/RCT - Ramsbottom carbon residue test

RDC - the rotating disc contactor used in the (furfural) extraction unit to increase the contact between the feed and solvent

RDU - redistilling unit, normally downstream of a

(luboil) hydrotreater to correct the viscosity, flashpoint, Noack volatility of the product

Redistillation - see RDU

Refinery - a complex of facilities where crude oil is separated into light and heavy fractions which are then converted into usable products or feedstocks

Refractive index - an indicator of the optical density of a material. Often used as a quality indicator in base oil plants

Replenishment - the physical acquisition of product (in its broadest sense) in order to restore stocks to their required levels

Repulp - the second stage of a two-stage dewaxing unit

Re-refining - the process of converting used luboil back into a base oil substitute. Processes such as acid-clay treating or distillation and hydrotreating may be used

Residue - heavy, non-volatile components of crude oil that flow from bottom of fractionating column during fractional distillation, see long residue and short residue

Revamping - the process of updating a unit to improve the quality of the plant or to return it to its original state. May involve debottlenecking

RI - refractive index

ROACE - return on average capital employed: a well-accepted financial performance ratio

RON - research octane number: a grade applicable to petrol and gasoline

RRBO - re-refined base oil

RTEP - real-terms earning power. Also known as IRR: internal rate of return

Run - plan or actual data on the operation of a facility, including a specification of :

- facility operating mode
- events and time instants at which operation starts, stops or changes.
- see also 'Test run'

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Glossary of terms

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S

SAE - Society of Automotive Engineers (USA)

Safeguarding - the systems, processes, operating procedures for a refinery unit to ensure its safe operation, see PSFS

Saybolt universal viscosity (SUS) - the time in seconds for 60 ml of fluid to flow through a standard Saybolt universal viscometer at a specified temperature

SCD - synthetic crude distillation - part of the SMDS technology

Scenarios - a set of possible future business environments which challenges decision-makers within the Shell Group. Each scenario is internally consistent, fundamentally different and relevant to the business. Scenarios are used for testing objectives, strategies and investment proposals. Although containing numerical data, they are conceptual and descriptive rather than quantitative

SCF - standard cubic feet

Scouting phase - the development of a project description and evaluation, including all relevant aspects of the project. This phase culminates in a scouting phase report

Scrubbing - the process of purifying a gas by washing it with a liquid

SDA - Shell dewaxing aid used in MEK - dewaxing

SDU - solvent dewaxing Unit also know as the MDU

Selectivity - the fraction of desired product

occurring in the total product slate

SEOP - Shell Europe Oil Products, the organisation formed 1/1/98 to refine, distribute and market oil products throughout Europe

Service contracts - contracts between Shell Global Solutions and its customers for the provision of specified services

Settler - vessel in a base oil manufacturing plant (and refinery) designed to have a sufficient residence time to permit the separation under gravity of two liquid phases

SEU - sulfolane extraction unit for the removal of benzene from light refinery streams, e.g. platformate or solvent extraction unit where the solvent may be furfural (FEU) or NMP for the upgrading of waxy distillates

SGP - Shell Gasification Process for the conversion of natural gas into synthesis gas (the first conversion in the SMDS process)

Shell Global Solutions - a trading style used by a network of technology companies of the Royal Dutch/Shell Group of companies offering services to both Shell and non-Shell customers

Short residue - the undistilled, bottom product from an HVU. Also known as vacuum residue

Shutdown - planned shutdowns of refinery units occur on a regular basis for maintenance of the unit; unplanned shutdowns are controlled operations to take the unit out of service that were not originally envisaged in the annual planning of the unit

SI - structure index, a confidential Shell Global Solutions description of the structure of a stream in a base oil plant greatly aiding the understanding of the operations and permitting the development of accurate blending rules for viscosity

Slack wax - the soft, oily crude wax obtained from the solvent dewaxing of paraffin distillates or lube base stocks. Slack waxes contain varying amounts of oil and must be deoiled to produce hard or finished waxes

SMDS - Shell Middle Distillate Synthesis. A Shell technology for the polymerisation of natural gas into liquefied products, from transportation fuels to lubricating oils to waxes. Commercialised in Bintulu, Malaysia. Incorporating gasification of, e.g., natural gas (in the SGP), polymerisation via Fischer-Tropsch chemistry in the heavy paraffin synthesis unit and conversion into the desired

product range (in the heavy paraffin conversion unit), including an XHVI waxy raffinate

Solomon Associates - an independent consultancy organisation that does benchmarking of the performances of refineries and base oil manufacturing plants (typically on a three-year cycle)

Solubility - the maximum amount of a solvate that may be fully dissolved in a solvent

Solvent extraction - the process of using a solvent to extract the undesired components from a feed stream: addition of the solvent to the feed, mixing (in the RDC), separation into two phases (in settlers) and recovery of the solvent for recycling within the unit. Typical solvent extraction units in refineries use furfural and NMP

Solvent neutral oil - a paraffinic base oil which has been solvent refined, dewaxed and finished

Solvent ratio - the mass of solvent divided by the mass of feed (needed to effect a desired extraction)

Solvent - common name for a liquid which is capable of dissolving or dispersing other substances

Solvex process - luboil solvent extraction process, i.e. solvent (furfural/NMP) extraction and MEK dewaxing

SOx - sulphur oxides, i.e. SO2 - sulphur dioxide and SO3 - sulphur trioxides, one of the products from the combustion of fuels containing sulphur

Space velocity - the mass/volume of feed per unit of catalyst per unit of time (WHSV = weight hourly space velocity = x kg-feed/kg-catalyst/hour; LHSV = liquid hourly space velocity = litres-feed/litre-catalyst/hour)

Specific gravity - the ratio of the density of a substance at a particular temperature to the density of water at 4°C

Specifications - see PSS

SPO - spindle oil distillate from the HVU

SPOSW - slack wax

Spot market - an international market in which oil or oil products are traded for immediate delivery at the current price (the 'spot price')

SR - short residue also known as vacuum

residue, the bottom product of a vacuum distillation unit (HVU)

SR - straight run, solvent ratio or short residue

Stability - the ability of a refinery product to resist changes with time

Standard - a document providing rules, guidelines or characteristics for activities or their results, aimed at achieving the optimum degree of order in a given context

Stanlow - the site of a Shell refinery in the UK

Start up - opposite of shutdown. A process that requires care and detailed procedures

STASCo - Shell International Trading and Shipping Company Ltd, London, England

Steam - refineries generally have boilers to generate steam from highly purified ('boiler feed') water which is then released into the HP (high pressure) circuit. Units in the refinery use the steam for their operations letting it down to MP (medium pressure) and/or LP (low pressure) steam circuits. The latter has little energy value and is either released into the environment of used for local heating (including district (home) heating in some cases)

Straight-run - a description applied to a product of crude oil that has been made by distillation with no chemical conversion.

Strategy - a framework for the plans designed to achieve company objectives. A strategy may be used as a screen for possible plans

Sulphur content - specifications on the sulphur content of finished refinery products are continually decreasing. The 'auto-oil'"programme in Europe will gradually reduce the sulphur contents of both gasoil and mogas

SW - slack wax - by-product of dewaxing process from the MDU and used as the feed for the manufacture of Shell's XHVI® base oils

S-Wax - slack wax

SWOT - (analysis of) strength, weaknesses, opportunities and threats

Syngas - a mixture of methane and CO usually resulting from a gasification process

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T

Tank - used for storage of large quantities (thousands of tons) of refinery products, as opposed to 'vessels'

TBP-GLC - true boiling point - gas liquid chromatography. The process (ASTM-D2887) for simulating the distillation of a small sample of a product using a gas chromatograph

Technical Services Agreement - the legal contract between Shell Global Services and a customer providing the framework for the supply of a range of technical services and advise over a long period of time

Technical white oil - hydrofinished base oils meeting specific maximum UV absorbance specifications

Test run - run in a refinery unit for a specific, generally non-standard purpose (e.g. maximum capacity, new feedstock, etc.) in which detailed input, output and operational data are measured, a mass balance determined and the results reported

Thornton - Site of a Shell Global Solutions centre in the UK

TLV-STEL - threshold limit value - short time exposure limit. A 15 minute TWA exposure which should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV-TWA

TLV-TWA - threshold limit value - time-weighted average - the time-weighted average concentration for a normal 8-hour work day and a 40-hour work week, to which all workers may be repeatedly exposed, day after day, without adverse effects. A definition of the ACGIH, the American Conference of Governmental and Industrial Hygienists

TO - transformer oil

TOR - terms of reference. The basis for a project

TOST - turbine oil stability test. A standard test to oxidise an oil resulting in the formation of acids [click here for more information]

TOST life - the time (in hours) that an oil takes to oxidise in the TOST until a specific acidity is reached

TPA - Tonnes per annun

TPC - total polar content in % wt

TQ - turbine quality

Triple effect - a highly efficient system for the recovery of a solvent involving three successive steps of flashing, heating and pressuring, cf. double effect

Trunion head - the flat end of a rotary vacuum filter used in a MEK dewaxing unit (MDU) which is in contact with the stationary side/casing of the filter. There are different connections in the trunion head permitting successive partial, then full, suction (to remove the dewaxed base oil-solvent mixture), suction (to remove the solvent-rich phase from washing the filter cake) and blowing (with nitrogen to push the slackwax cake off from the filter cloth)

TSA - Technical Services Agreement - an arrangement whereby Shell Global Solutions provides a range of defined services to a customer

TWO - technical white oil, a base oil that has been purified by hydroprocessing to reduce the concentrations of aromatics in the product to a lower level of specifications

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U

UND - unneutralised naphthenic distillate

Used luboil - when a lubricating oil has reached the end of its effective life it has to be replaced. The resulting 'used', sometimes also referred to as 'waste', oil may contain non-negligible amounts of acids, halogens and polycyclic aromatics. It should be collected to permit its re-use to recover its hydrocarbon value and to prevent pollution of the environment. It may then be burned to recover the energy content or rerefined

Utilities - the generic term for the refinery plants and units that are not directly connected with the manufacture of products (e.g. steam generation, water treatment, etc.)

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V

Vacuum - less than one atmosphere

Vd - dynamic viscosity in centipoise

VDU - vacuum distillation unit synonym of HVU

Vessel - in a refinery a vessel generally has a

volume of less than 20 m3, about the same size as a road tanker

VGO - vacuum gas oil from the HVU (top prods)

VHVI - very high viscosity index base oils

VI or viscosity index - an arbitrary system which has been devised for indicating the relative rate of change of viscosity of a fluid with temperature [click here for more information]

Viscosity - the measure of the internal friction or the resistivity to flow of a liquid [click here for more information]

Vk - kinematic viscosity in cSt

Volatile - term used to describe substances with low molecular weight that will evaporate at normal atmospheric temperatures and pressures, c.f. Noack volatility

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W

Waste water - the result of a (refinery) process requiring treatment before it is returned to the environment

Wax - plastic, fusible and viscous or solid substance having a characteristic lustre. Wax present in crude oil belongs to two major varieties: paraffin wax and petrolatum. It has to be removed from a waxy distillate to improve its pour point

Waxy distillate - the products from the HVU prior to further treatments to improve their qualities, c.f. SPO, LMO, MMO and SR

Waxy raffinate - the products from the FEU prior to dewaxing

White oil - a colourless and odourless mineral oil used in medicinal and pharmaceutical preparations and as a lubricant in food and textiles

White products - gasoline, naphtha, kerosine and gas oil, i.e. products from the high or light end of the distillation process. See also: black products, light fractions

WR - waxy raffinate ex FEU prior to dewaxing in the MDU

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X

XHVI® - Shell synthetic eXtra high viscosity index oil

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Y

Yield - the mass of the desired product(s) divided by the mass fed to the unit or process, c.f. selectivity

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Z

No entries currently under this heading